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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,109	02/03/2004	Jeremie Dalton	NOVLP082/002893	4875
22434	7590	07/31/2006	EXAMINER	
BEYER WEAVER & THOMAS, LLP			STARK, JARRETT J	
P.O. BOX 70250			ART UNIT	
OAKLAND, CA 94612-0250			PAPER NUMBER	

2823

DATE MAILED: 07/31/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/772,109

Applicant(s)

DALTON ET AL.

Examiner

Jarrett J. Stark

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

In response to the Applicant's argument regarding claims 1 & 12, that Lopatin does not contain support or teach depositing a "copper metallocene", wherein a metallocene, as defined by the Applicant, is a central metal bound to one or more cyclopentadienyl ligands. The examiner points out that Lopatin discloses on line 1 of page 25 of the provisional application using cyclopentadienylcopper(I)triethylphosphine $((C_5H_5)Cu:P(C_2H_5)_3)$ as a precursor, which inherently means (according to and Representative's definition of a metallocene and conventional understanding of what a precursor is) that a "copper metallocene" is being deposited.

In response to the Applicant's argument that Lopatin does not expose the device to an oxidizing atmosphere. Paragraph [0009] discloses a purpose of the invention is to "minimize oxidation effects" when copper is exposed to atmospheric conditions [0008]. "Atmospheric conditions" is understood to mean the atmosphere here on Earth, in which the atmosphere comprises around 21% oxygen making it an oxidizing atmosphere. Paragraph [0010] teaches "Another approach is to activate the copper surface by depositing a catalytic material on the copper surface" and the "copper metallocene" activating layer is deposited with the precursor stated above.

Therefore Lopatin discloses and anticipates in both the provisional and the publication all of claims 1 & 12.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-23 are rejected under 35 U.S.C. 102(a) as being anticipated by Lopatin et al. (US 2005/0085031).

Regarding claim 1, Lopatin discloses a method of protecting an exposed copper surface of a partially fabricated IC from oxidation during exposure to an oxygen-containing environment, the method comprising: contacting the exposed copper surface with a metallocene compound; and contacting the exposed copper surface with the oxygen-containing environment, whereby exposure to the metallocene compound minimizes formation of copper oxide on the exposed copper surface (Lopatin, [0009]);

wherein the metallocene compound contains a metal bound to one or more cyclopentadienyl ligands (Lopatin's provisional application discloses "cyclopentadienyl ligands" bound to a metal on page 25 line 1).

Regarding claim 2, Lopatin discloses the method of claim 1, wherein the metallocene contains a metal selected from the group consisting of ruthenium, cobalt,

nickel, iron, palladium, platinum, titanium, chromium, osmium, and manganese (Lopatin, [0083]).

Regarding claim 4, Lopatin discloses the method of claim 1, wherein contacting the exposed copper surface with a metallocene compound comprises flowing a gas containing metallocene over the partially fabricated IC (Lopatin, [0080]).

Regarding claim 5, Lopatin discloses the method of claim 1, wherein contacting the exposed copper surface with the oxygen-containing environment comprises contacting the exposed copper surface with a compound that forms a solid phase layer on the partially fabricated IC (Lopatin, [0009]).

Regarding claim 6, Lopatin discloses the method of claim 5, wherein the compound is a precursor compound that reacts with an oxygen-containing species to form the solid phase layer (Lopatin, [0009]).

Regarding claim 7, Lopatin discloses the method of claim 1, wherein contacting the exposed copper surface with the oxygen-containing environment comprises contacting the exposed copper surface with a diffusion barrier precursor, which reacts with an oxygen-containing species to form a barrier layer on the partially fabricated IC (Lopatin, [0012]).

Regarding claim 8, Lopatin discloses the method of claim 7, wherein the oxygen-containing species is molecular oxygen (Lopatin, [0008])

Regarding claim 9, Lopatin discloses the method of claim 1, wherein contacting the exposed copper surface with the oxygen-containing environment comprises

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contacting the exposed copper surface with an etch stop precursor, which reacts with an oxygen-containing species to form an etch stop layer on the partially fabricated IC (Lopatin, [0009]).

Regarding claim 10, Lopatin discloses the method of claim 1, wherein contacting the exposed copper surface with the oxygen-containing environment comprises contacting the exposed copper with the ambient or other oxygen-containing environment during storage or transport between processing modules (Lopatin, [0008]).

Regarding claim 11, Lopatin discloses the method of claim 1, wherein the exposed copper surface comprises a copper seed layer on the partially fabricated IC (Lopatin, [0016]).

Regarding claim 12, Lopatin discloses a method of passivating and using an exposed copper surface of a partially fabricated IC, the method comprising: contacting the exposed copper surface with a metallocene compound to thereby passivate the surface (Lopatin, [0083]) ; and

wherein the metallocene compound contains a metal bound to one or more cyclopentadienyl ligands (Lopatin's provisional application discloses "cyclopentadienyl ligands" bound to a metal on page 25 line 1) and

depositing a layer of material on the partially fabricated IC using an oxygen-containing deposition chemistry (Lopatin, [0009]).

Regarding claim 13, Lopatin discloses the method of claim 12 further comprising performing the contacting and depositing step in a single chamber. (Lopatin, Claim 65)

Regarding claim 14, Lopatin discloses the method of claim 12 wherein the depositing is conducted using the metallocene compound as a chemical precursor to the material. (Lopatin, [0083])

Regarding claim 15, Lopatin discloses the method of claim 12 wherein the contacting and depositing operations are done concurrently. It is inherent that if a material is being deposited upon a layer it will be contacting the layer it is being deposited upon.

Regarding claim 16, Lopatin discloses the method of claim 12, wherein the metallocene is contains a metal selected from the group consisting of ruthenium, cobalt, nickel, iron, palladium, platinum, titanium, chromium, osmium, and manganese (Lopatin, [0083]).

Regarding claim 18, Lopatin discloses the method of claim 12, wherein contacting the exposed copper surface with a metallocene compound comprises flowing a gas containing metallocene over partially fabricated IC. (Lopatin, [0080])

Regarding claim 19, Lopatin discloses the method of claim 12, wherein the depositing of a layer of material comprises contacting the exposed copper surface with a compound that forms a solid phase layer on the partially fabricated IC (Lopatin, [0009]).

Regarding claim 20, Lopatin discloses the method of claim 12, wherein the depositing of a layer of material comprises contacting the exposed copper surface with a diffusion barrier precursor, which reacts with an oxygen-containing species to form a barrier layer on the partially fabricated IC (Lopatin, [0009]).

Regarding claim 21, Lopatin discloses the method of claim 20, wherein the oxygen-containing species is molecular oxygen (Lopatin, [0008]).

Regarding claim 22, Lopatin discloses the method of claim 12, wherein depositing a layer of material comprises

contacting the exposed copper surface with an etch stop precursor, which reacts with an oxygen-containing species to form an etch stop layer on the partially fabricated IC (Lopatin, [0009]).

Regarding claim 23, Lopatin discloses the method of claim 12, wherein the exposed copper surface comprises a copper seed layer on the partially fabricated IC (Lopatin, [0016]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3 & 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lopatin et al. (US 2005/0085031).

Regarding claims 3 & 17, Lopatin discloses the method of claim 1 & 12, wherein the metallocene is ruthenocene. (Lopatin, [0083]). Lopatin, does not however disclose metallocene containing ruthenium (ruthenocene) in the provisional application.

Lopatin (provisional application) discloses the claimed invention except for using specifically ruthenocene.

However it is notoriously well known in that art that ruthenium is an equivalent alternative to the list of metals previously stated above regarding claim two. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have a metallocene containing ruthenium thereby having ruthenocene, since it has been held to be within the general skill of a worker in the art to select a known material on the base of its suitability, for its intended use involves only ordinary skill in the art. *In re Leshin*, 125 USPQ 416.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jarrett J. Stark whose telephone number is (571) 272-6005. The examiner can normally be reached on Monday - Thursday 7:00AM - 5:30PM.

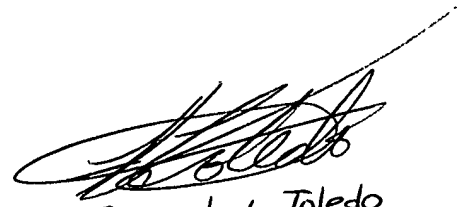
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JJS

April 19, 2006



Fernando L. Toledo
Patent Examiner
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